



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/637,094 | 08/06/2003 | Bruno Ghyselen | 4717-6300 | 9064 |

28765 7590 11/18/2004

WINSTON & STRAWN
PATENT DEPARTMENT
1400 L STREET, N.W.
WASHINGTON, DC 20005-3502

EXAMINER

PHAM, THANH V

| | |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

2823

DATE MAILED: 11/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|--------------------------------------|--|--|
| Office Action Summary | Application No. 10/637,094 | Applicant(s) GHYSELEN ET AL. | |
| | Examiner Thanh V Pham | Art Unit 2823 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20,23 and 24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20,23 and 24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>08/06/03</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Claims 21-22 are withdrawn *and canceled* from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 09/29/04.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claims 1-8, 12, 16, 18-20 and 23-24 rejected under 35 U.S.C. 102(a) as being anticipated by Vuong et al. US 2004/0017574 A1.

Re claim 1, the Vuong et al. reference teaches a method for adjusting the thickness of a thin semiconductor material layer, figs. 1-2 and the associated paragraphs, which comprises:

measuring the layer [0037], e.g., to establish a thickness profile [0046], steps 330, 340 of fig. 2, e.g.;

comparing the measured thickness profile with stored standard profiles [0037], [0050], e.g., wherein each standard profile is stored in association with respective thickness adjustment specifications [0052], e.g.;

selecting a stored standard profile to associate the layer with the respective thickness adjustment specification [0003], [0010], [0048] and fig. 5, e.g.; and

adjusting the thickness of the layer in accordance with the thickness adjustment specification [0055], [0061], [0087], steps 380-398 of fig. 2, e.g..

Re claim 2, wherein the thickness adjustment specifications are recipes 54, [0066], e.g.

Re claim 3, the method which further comprises establishing association between the stored standard profiles and the recipes [0037], fig. 3.

Re claim 4, the method further comprises establishing associations by using an algorithm having a target specification input for thickness profile established for layer fabrication [0086].

Re claim 5, the method further comprises using identical meshes to establish the thickness measurements, the standard profiles, and the target specification [0039], [0040].

Re claim 6, the method further comprises automatically reactivating the configuration algorithm on each change of target specification to establish a new configuration defining correspondences between the standard profiles and the recipes [0086].

Re claims 7-8, the method further comprises storing at least one configuration associated with the thickness measurement or a plurality of configurations, and selecting a desired configuration [0091].

Re claim 12, wherein the algorithm selects categories of recipes as a function of thickness differences between the target and the standard profile to establish a configuration, without searching through all recipes [0086], [0092] and fig. 4.

Re claim 16, the method further comprises applying thickness adjustments simultaneously to the layer surface, wherein the adjustments may differ depending on location on the layer surface [0072].

Re claims 18-19, the method further comprises treating batches of layer, wherein one layer thickness in the batch is adjusted by a certain given pitch while a subsequent layer thickness is being measured; wherein the layers of a given batch share the same final target thickness, and the recipe for each layer is individualized to ensure that once thickness adjustment has been completed, a mean layer thickness is obtained for the batch that is as close as possible to the common target [0084]-[0086].

Re claim 20, wherein the recipes correspond to at least one of uniform thickness modification across the layer, or differential thickness modification across the layer [0075] and figs. 12, e.g.

Re claim 23, wherein each standard profile is stored in storing means 1850/1860 and the measured thickness profile is compared with stored standard profiles by a processor unit 1840 associated with the storing means, with the processor configured to receive measurements made on the layer from thickness measuring means 1860, and

Art Unit: 2823

to forward thickness adjustment specifications to thickness adjustment means 1830, fig. 6A.

Re claim 24, wherein the thickness measuring means is at least one of an ellipsometer and a reflectometer [0007], [0036], [0037], [0040], e.g.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 9-11, 13-15 and 17 rejected under 35 U.S.C. 103(a) as being unpatentable over Vuong et al. as applied to claims 1-8, 12, 16, 18-20 and 23-24 above, and further in view of Ferrell et al. US 6,751,343 B1 and Wolf, Silicon Processing for VLSI Era, vol. 1, chapter 7.

The Vuong et al. reference though teaches a method as in the above, refers to use of data-gathering criterion to test/compare whether sufficient data about the structure is available to perform the model and parameter selection [0056] and make a final selection of optimization parameters based on one or more selection criteria [0084]; although the flowchart/diagram of fig. 5 resembles a tree structure having selecting zones of the standard profile (*re claim 10*) defined by recipe parameters (*re claim 14*), provides the step 375 of fig. 2 for adjusting the profile model and/or the parameter selection criteria (*re claim 13*), it discloses **neither** the tree structure defining

Art Unit: 2823

categories and sub-categories with a desired number of levels (*re claim 9*), finer and finer levels of detail (*re claim 11*), wherein the high level categories of recipes in the recipe tree structure include: a first high level recipe category defining a uniform thickness adjustment specification for the entire surface of the layer; and additional high level categories depending on overall distribution parameters for thickness adjustment specifications over the surface (*re claim 15*) **nor** establishing a link between a starting level of a standard profile tree structure and an arrival level of a recipe tree structure, such that for each standard profile belonging to a given category of starting level there exists an arrival level category of recipes; searching for a recipe for a standard profile at the starting level by automatically directing the search towards the arrival level category; and continuing the search by going deeper into the recipe tree structure to establish a configuration (*re claim 13*), **nor** adjusting the layer thickness by sacrificial oxidation (*re claim 17*).

The Ferrell et al. reference teaches a system and method for indexing and retrieving data for subsequent fast retrieval (col. 2, lines 50-52) so that a corrective action can be quickly taken (col. 2, line 44), the tree diagram of fig. 6 depicts a hierarchical search tree for use with the method of fig. 7 wherein defining categories and sub-categories with desired number of levels and finer and finer levels of detail. The method "has been applied to continuously manufactured web products such as ... thick and thin film ceramics" col. 8, lines 40-43. The "method ... can be subdivided into two process: a method for indexing ... and a method for retrieving, col. 5, lines 62-65. The method for indexing begins in step 10 of fig. 3A, adding feature vector to vector list at

Art Unit: 2823

step 18, creating node after loading next feature vector then inserting top-down node in indexing tree (steps 28-32 in fig. 3B). Fig. 7 is a flow chart illustrating a method for retrieving information stored in a hierarchical tree structure as in fig. 6. wherein the search for a standard profile at the starting level by automatically directing the search towards the arrival level category (steps 42, 44) and continuing the search by going deeper into the recipe tree structure to establish a configuration (steps 48, 60).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the hierarchical tree structure of Ferrell et al. into the library of Vuong et al. as the tree structure would be selected in accordance with the method for adjusting the thickness of a thin semiconductor material layer in order to index and retrieve data for subsequent fast retrieval so that a corrective action can be quickly taken in the manufacturing process as taught by Vuong et al.

Re claim 17, Wolf discloses "thermal oxidation of single crystal silicon" with "tightly controlled" and "various techniques are available for measuring oxide thickness" including "automated ellipsometry equipment", page 235. To employ sacrificial oxidation for adjusting the layer thickness would have been obvious to one of ordinary skill in the semiconductor coating art as the oxidation would be selected in accordance with the thickness control after measurement and consideration of related parameters in a method for adjusting the thickness of a thin semiconductor material layer as taught by Vuong et al.

Art Unit: 2823

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh V. Pham whose telephone number is 571-272-1866. The examiner can normally be reached on M-Th (6:30-5:00).


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

WP

TvP

11/10/04


George Fourson
Primary Examiner